SUMMER 2019

WESTERN MICHIGAN UNIVERSITY

W Magazine

Genetically modified mosquitoes are generating buzz

Also inside
Innovations in accessibility for people with visual impairments

Beneficial Burn

As part of ongoing efforts to actively manage WMU's Asylum Lake Preserve for research, education, passive recreation and ecological health, flames scorched areas of the nature preserve in April. Prescribed burns like those set this past spring are fires that are intentionally ignited and carefully managed. They are periodically necessary to maintain and promote the health of native vegetation.

CONTENTS

EXECUTIVE EDITOR
Paula M. Davis

CONTRIBUTING EDITORIAL STAFF
Jeanne Baron, M.A. '89
Diana Berkshire Hearit
Erin Flynn
Deanne Puca
Teresa Ventimiglia

ART DIRECTOR
Kim C. Nelson

CREATIVE TEAM
Mark Bugnaski
Madeleine Fojtik, M.A. '12
Debbi Kreps, B.S. '88
Shelli Osterhout

PRODUCTION STAFF
Bradley Horstman

CONTRIBUTING PHOTOGRAPHERS
Joe Ahlquist
Christopher Deau
Mike Lanka
Stephanie Murray

QUESTIONS OR COMMENTS?
Contact Paula M. Davis at paula.davis@wmich.edu

FREQUENCY
The *W Magazine* is published quarterly. It is owned by Western Michigan University, 1903 W. Michigan Ave., Kalamazoo, MI 49008-5433. Views expressed in the magazine are not necessarily those of the University. WMU is an equal opportunity/affirmative action institution and a member of the Association of Public and Land-Grant Universities as well as the Council for Advancement and Support of Education.

8. Generating Buzz
Researcher helps African countries evaluate a highly anticipated malaria-fighting method—a genetically modified mosquito

20. Hey, Siri—
Did you know WMU leads the way in studying human-robot communication?

24. Honored for Innovation
A helmet sensor tech biz is scoring goals even before its product hits the gridiron

26. Highly eSTEAMed
Art and chemistry collaboration highlights the importance of not blowing off STEAM

28. Broncos' Big Ideas
WMU among finalists in National Science Foundation Idea Machine competition

29. Awarded for Excellence
Geography master's degree program earns national accolade

31. STEM Standouts
Two WMU leaders recognized as "notable women in STEM"

32. Reduce, Reuse, Research
Student's study optimizes recycling centers

4. University News

22. Expert Insights

30. Alumni Profile

On the cover: As malaria concerns rise around the globe, some scientists found a way to genetically modify female mosquitoes that transmit the disease. A WMU researcher is assisting African leaders in assessing the technology.

Innovations for Accessibility

12. Feeling Their Way Around
Team develops 3D maps to help people with visual impairments navigate their world

15. Sound Performance
How one student's voice enhanced theater for enthusiasts

18. Vested Interest
Wearable technology creates new layer of safety beyond the white cane

The creation of 3D-printed maps, such as this map of the College of Health and Human Service's fourth floor, is one of several projects researchers and students are pursuing to aid people who are blind or have low vision.

DEAR FRIENDS,

Teaching, learning and research at Western Michigan University are focused on advancing the public good. This mission energizes the passion and purpose of Broncos. The community is driven to be change agents and thought leaders, well-equipped and ready to engage our intellect and our grit to take on the challenges of our time.

Advancing the public good is what moved a research associate to help officials in African communities gauge the implications of deploying genetically modified mosquitoes to fight malaria.

It is exemplified by faculty members producing ideas at WMU that, in the National Science Foundation Idea Machine competition's assessment, demonstrate great potential for setting the nation's agenda in basic science and engineering research.

Advancing the public good is what moved a professor and his former doctoral student to create an impact-sensing football helmet to enhance player safety.

And our commitment to pursuing knowledge that makes a difference in society is evident as faculty, students and staff create innovations in accessibility for people who have visual impairments.

As an educational institution, WMU's goal is to stimulate the development of our students—their talent, their curiosity, their drive to change things for the better for themselves, their communities and for our world. Through their efforts, as guided by faculty and staff, our students make a genuine difference.

Delve into this summer edition of the *W Magazine* to learn much more about these endeavors and I think you will agree, Broncos have great impact by doing good.

Best wishes,

Edward Montgomery

Edward Montgomery, Ph.D.
President

Alumna, Broadway star Mazzie feted with posthumous Tony Award

Mazzie

In June, the Tony Awards honored alumna Marin Mazzie with a special posthumous award for her leadership and advocacy in the theatre industry.

Mazzie, a 1982 graduate of WMU, was a theatrical force. A three-time Tony Award nominee, she broke onto the Broadway stage in 1985 and never looked back. Mazzie starred in productions such as "Into the Woods," "Ragtime" and "Kiss me Kate."

"She's just a kind of epic part of Broadway history—having originated so many important roles, and then being so public with her cancer battle and being so inspirational to so many as well," says Jay Berkow, director of music theatre performance at WMU.

After her ovarian cancer diagnosis in 2015, Mazzie became a fierce advocate for cancer research. Cancer couldn't keep Mazzie from the stage. Even as she was undergoing therapy and treatments, she was performing in shows. Mazzie died in September 2018, at the age of 57.

"Her legacy is that she set the standard. She raised the bar," says D. Terry Williams, professor emeritus of theatre at WMU. "You always want your students to have a role model in mind. She certainly has been it for generations of students, and she was for her peers when she was here." ■

Montgomery elected to American Academy of Arts and Sciences

President Edward Montgomery joined an illustrious list of fellows with his election to the American Academy of Arts and Sciences.

Founding father Benjamin Franklin, poet Ralph Waldo Emerson and civil rights icon Martin Luther King Jr. are among those who have been elected to the academy over the centuries.

This year's class of some 200 includes former first lady Michelle Obama, artist Mark Bradford, Purdue University President and former Indiana Gov. Mitchell E. Daniels, author Jonathan Franzen and Howard Hughes Medical Institute cell biologist Dr. Jennifer Lippincott-Schwartz.

The academy recognized these individuals for outstanding achievements in academia, the arts, business, government and public affairs.

Montgomery joins the new class as a University president and as a nationally renowned labor economist who has had a distinguished career in higher education and at the highest levels of federal government, where he held key positions during the Clinton and Obama administrations.

As WMU's president, Montgomery has launched initiatives focused on student success, revitalizing the southern region of main campus, the development of a new budget model impacting all areas of campus, and the implementation of a revised core curriculum, WMU Essential Studies. As part of his commitment to helping students complete their studies, Montgomery also implemented a targeted grant program to assist financially at-risk students.

"I am deeply honored by my election to the American Academy of Arts and Sciences," Montgomery said in April. "To be numbered among such an august and accomplished group of individuals is incredibly humbling."

The academy was founded in 1780 by John Adams, John Hancock and others who believed the new republic should honor exceptionally accomplished people and engage them in promoting the public good.

With the election of new members, "the academy upholds the ideals of research and scholarship, creativity and imagination, intellectual exchange and civil discourse, and the relentless pursuit of knowledge in all its forms," David W. Oxtoby, president of the American Academy of Arts and Sciences, said in a statement.

The new class will be inducted at a ceremony in Cambridge, Massachusetts, in October. ■

Bronco pride and joy: More than 1,300 students became newly minted WMU alumni in June.

The College of Aviation's new instructional building will include state-of-the-art simulation technology. Construction is expected to be finished in summer 2020, with classes beginning in the space the following fall.

Coming aviation building expansion sparked by enrollment, industry growth

A new state-of-the-art Aviation Education Center will provide additional space for the College of Aviation's soaring enrollment, which is fueled by demand for pilots and aviation mechanics.

Completion of the $20 million building project—including a $15 million grant from the state of Michigan—is expected in summer 2020, with classes beginning in the new 67,000-square-foot space the following fall.

Construction adds classrooms, a computer room, composites/paint laboratory upgrades, a state-of-the-art simulation center, a premier research center, student briefing rooms, faculty office space, a café and other amenities, as well as the latest technology to the college.

Located at the W.K. Kellogg Airport in Battle Creek, Michigan, the college has seen its enrollment grow 35 percent in the past five years to about 1,000 students as high job growth and demand for aircraft pilots, aircraft technicians and management personnel place WMU in the position to be Michigan's major resource to prepare students for these jobs, says the college's dean, Dave Powell.

"The needs of our industry are tremendous, and these trends are expected to continue as projected increases in passenger traffic fuel the demand for these highly skilled, highly paid industry jobs," Powell says.

It is anticipated that future demand for pilots, airline managers, administrators and maintenance personnel will significantly increase as the current workforce ages out of the marketplace and global demands for skilled aerospace professionals increases.

The Federal Aviation Administration projects that total airline passenger traffic is expected to double by the year 2032, and a recent Boeing Pilot and Technical Outlook report forecasted that by 2034, the aviation industry will need to supply more than 1 million new aviation personnel, including 558,000 pilots and 609,000 maintenance technicians. ■

WMU is a driver in diversifying economics field

Economists base much of their work on the belief that equal opportunity is vital to how society functions. Yet, the economics profession has faced a persistent lack of women and members of underrepresented racial and ethnic groups.

Addressing this gap is a priority for the WMU Department of Economics. WMU has partnered with Michigan State University to offer an innovative program designed to increase diversity in economics doctoral degrees and professions for the past three years.

The American Economic Association's Summer Training Program and Scholarship Program offers talented undergraduates from diverse backgrounds the opportunity to develop their math, technical and research skills to meet the high demands of academically challenging doctoral programs.

AEA reports that some 20 percent of all doctorates awarded to underrepresented minority scholars in economics can be attributed to the WMU-MSU summer program, which accepts 30-40 students, typically juniors or seniors, from around the country.

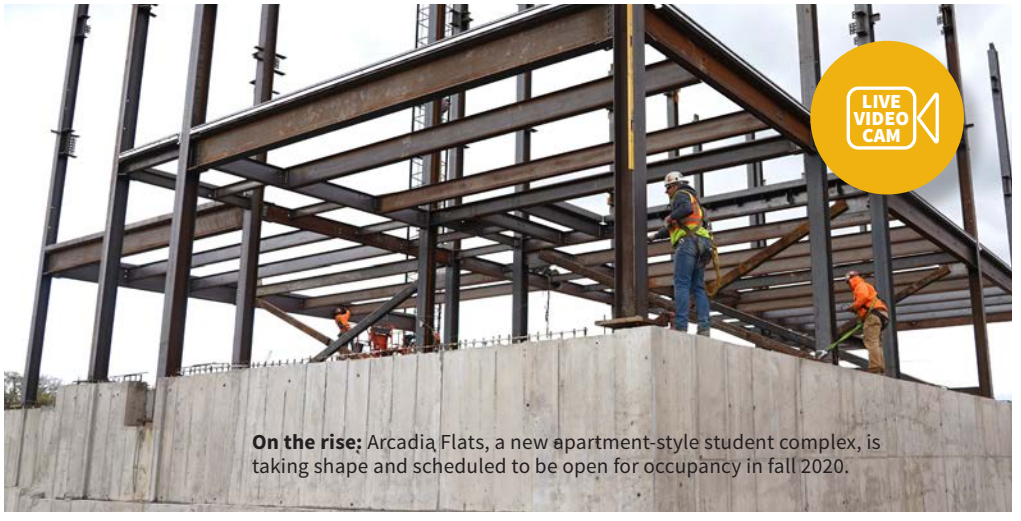
"Preparing a diverse pool of students for the rigors of graduate school in economics is an initiative we are proud to support," says Dr. Christine Moser, WMU professor of economics and associate director of the summer program, which is funded by more than $2.3 million in grants from the National Science Foundation and other organizations.

Most of the program's students are considering graduate school, but some are interested in public policy or other economic professions, she says. "Both the academic rigor and mentoring in the program gives these students a great opportunity to move to the next level in their education or careers." ■

WMU GIVING DAY

Get Ready!

WMU's third annual Giving Day is set for **Oct. 9** this year.
***Learn more at* wmualumni.org/givingday.**



On the rise: Arcadia Flats, a new apartment-style student complex, is taking shape and scheduled to be open for occupancy in fall 2020.

fm.wmich.edu/ap/webcam/south

Transformation of southern region of Main Campus on track

The transformation of the University's south campus neighborhood—now called Hilltop Village—is underway.

The vision for a major revamp of this region of Main Campus, a large swath between Western Michigan Avenue to the north and Stadium Drive to the south, is to create a vibrant district that ultimately combines housing, retail, office, academic, outdoor recreation and athletic spaces.

The initial projects include a new apartment-style student housing complex called Arcadia Flats as well as a new student center with an attached dining facility. These projects kicked off with demolition of the Elmwood Apartments last year and the razing of the southern wing of McCracken Hall.

Overlooking Stadium Drive, Arcadia Flats is the first construction to begin rising in Hilltop Village as part of the transformation. Under construction and scheduled to open for the fall 2020 semester, it is designed to be an innovative housing concept that offers multiple living options to meet the diverse needs of today's students.

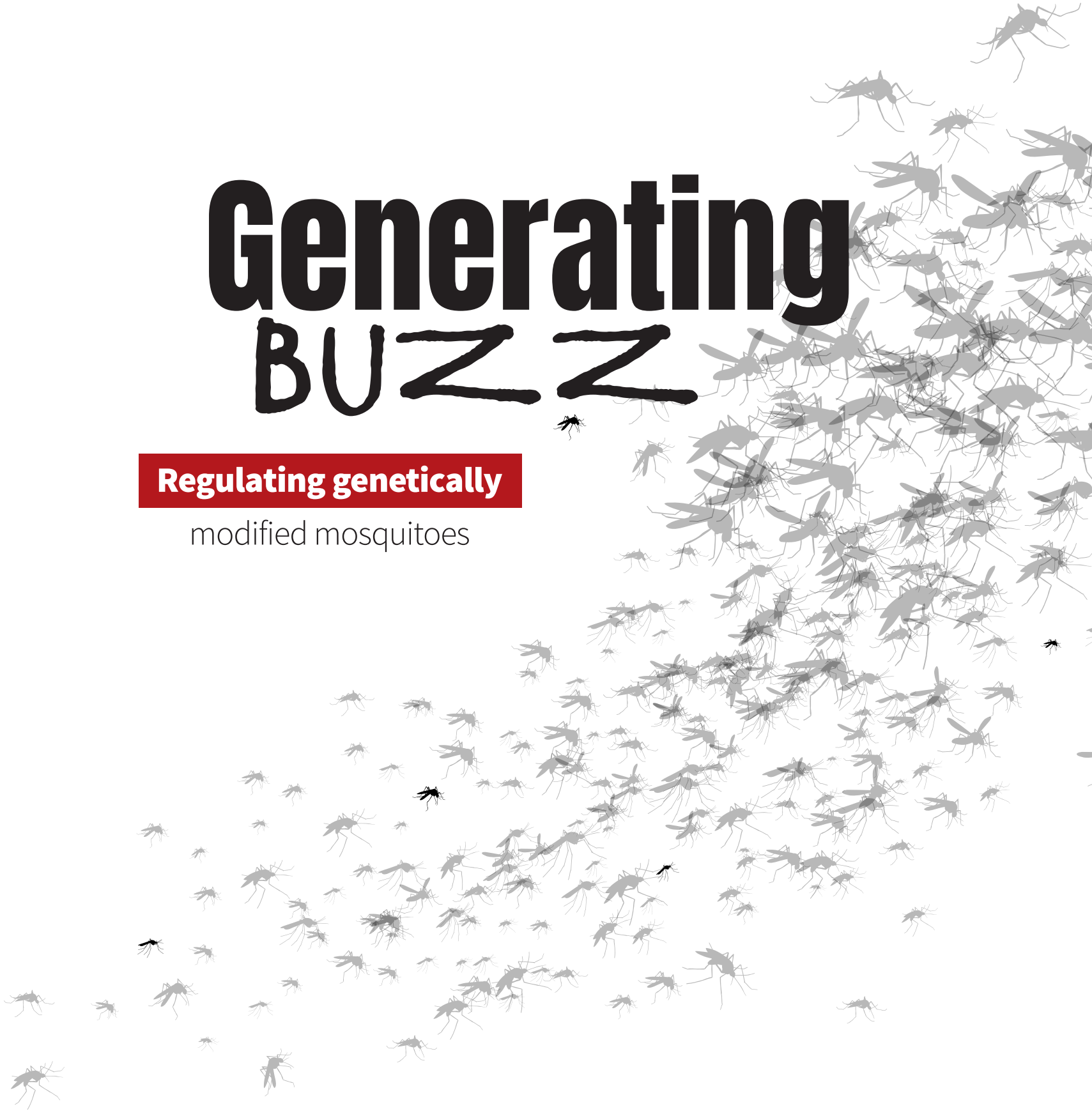
And making way for the future student center and dining facility combo, the remaining portion of McCracken Hall was demolished this summer.

To watch Arcadia Flats and other Hilltop Village developments take shape, check out the live video cam at fm.wmich.edu/ap/webcam/south. For more information about WMU's major ongoing projects, visit the Capital Projects webpage at wmich.edu/capitalprojects. ■

Generating BUZZ

Regulating genetically

modified mosquitoes



Gene-drive mosquitoes are generating a lot of buzz right now. The genetically modified bugs could potentially be used to reduce populations of their malaria-carrying counterparts or make those populations unable to carry malaria at all. But there's also much debate about the impact the new technology could have on communities being ravaged by the disease.

Dr. Hector Quemada, a principal research associate at WMU, is working to strengthen the understanding of African government and regulatory officials about the technology, so that they are equipped to develop science-based regulations.

Quemada

"The continent itself is pretty inexperienced in the regulation of genetically modified organisms," Quemada says. "Only a few countries in Africa have that kind of experience and usually that's in the area of genetically modified crops. However, they will be among the first to be faced with decisions that relate to this technology."

Quemada received more than $3 million in grants from the Foundation for the National Institutes of Health for "regulatory capacity strengthening for gene-drive related activities."

"Our job here at Western is to help those countries be better informed about this technology as they are working to develop their regulations and policies," says Quemada.

THE TECHNOLOGY

The development and release of gene-drive mosquitoes in scientific labs has generated some controversy.

In order to stop the spread of malaria, scientists engineered a genetic mutation that stops female mosquitoes from being able to bite or lay eggs. The gene is linked with another genetic element—"gene drive"—that assures the gene is passed on to virtually all offspring, instead of just half, as traits are normally shared.

Researchers in Terni, Italy, are currently testing these modified insects in large containment cages. They are doing so in a high-security facility in a region where the species of mosquito being developed for use in Africa could not survive if it managed to escape the lab. Other researchers are working on other genes, including genes that make the mosquito unable to transmit the malaria-causing parasite.

While the goal is to wipe out a disease that kills hundreds of thousands of people every year, especially children in Africa, critics worry that introducing these genes could have a negative impact on insect populations down the road and potentially lead to other dangerous diseases emerging. Some are also raising concerns about Africa being used as a testing ground for this developing technology.

BOOTS ON THE GROUND

Quemada and his team travel to African countries to host intensive training workshops in collaboration with the African

Union Development Agency. They give leaders and regulatory officials a basic understanding of the technology, educating them on the tools available to assess risks connected to it and offering case studies that they can work through for practical experience.

This year the team has already made a trip to Uganda. They plan to travel to Africa at least three times per year and are applying for more funding to conduct smaller follow-up meetings and develop e-learning tools. They will also be working with African scientists and other experts to eventually transition most of the training to them.

"We'd like to keep the ball rolling so whatever is learned and decided upon in these workshops, we can keep things moving on the regulatory side."

The team also works with the African Union Development Agency to organize tours by government officials to countries that are already deploying mosquito-control technology, including in Colombia and Brazil.

"In Brazil especially, there are examples of genetically modified mosquitoes without gene drive that are being used in their government's public health efforts to try to reduce the level of mosquitoes that carry Zika virus, dengue fever and other types of diseases," says Quemada.

There are also organizations like the World Malaria Program that have infected mosquitoes with bacteria that gets passed on from generation to generation, hindering reproduction.

"These are two different approaches, but at least things that these officials can see happening are alternatives to what they may be using to control malaria mosquitoes like insecticide treatments and various medicines they may have for preventative purposes."

INSTILLING KNOWLEDGE

While Quemada and his team help communities identify risks and issues of interest surrounding this technology, his role is not to make any decisions.

"We are not allowed to work directly with the governments themselves or the regulatory agencies to help write up regulations. We see our role primarily as providing them with the information, the knowledge and the various perspectives on how they can deal with the technology.

"The details may be different, but I think the questions they're asking are the same in terms of effect on human health, animal health and the environment," says Quemada. "There are all kind of common questions and issues that we would have to deal with regardless of what the organism is."

Quemada and his team are also involved in monitoring international agreements to regulate genetically modified organisms.

"This is a technology that's being heavily regulated by international bodies like the United Nations. So, we pay a lot of attention to what's happening in those venues, like the Convention on Biological Diversity," says Quemada. "We just keep track of policy development and try to provide reliable information to those who consult us."

In July, the Target Malaria project conducted a release of genetically modified mosquitoes in Burkina Faso, a country where Quemada's team has worked to provide training in these new genetic technologies. The first-stage test—the first of its kind on the African continent—is considered a milestone that could eventually lead to the development of gene-drive applications to control malaria in the area. ■

Malaria by the NUMBERS

219,000,000

CASES OF MALARIA
WORLDWIDE IN 2017

435,000

MALARIA DEATHS
WORLDWIDE IN 2017

266,000

NUMBER OF
MALARIA DEATHS
INVOLVING CHILDREN
5 YEARS OLD AND YOUNGER

92%

WORLD'S MALARIA CASES
LOCATED IN AFRICA

3.1 billion

DOLLARS IN FUNDING FOR
MALARIA CONTROL AND
ELIMINATION IN 2017

Stats from
WORLD HEALTH ORGANIZATION

Feeling their way around

Leah Barton, a student and VR lab manager who helped create 3D-printed maps of the College of Health and Human Services building, holds an early version of a design.

---3D maps could help people with visual impairments navigate their world

"Oh my goodness, it's beautiful! I cannot believe it came out so well. Wow!" gushes Dr. Dawn Anderson.

Beauty is in the eye of the beholder. Or in this case, the hand.

Anderson, an assistant professor of blindness and low vision studies, is holding a 3D-printed map of the fourth floor of WMU's College of Health and Human Services building.

The white plastic model may not look like much. There are no bells and whistles; no colors or labels. But this could be a map to a new world for students with visual impairments and their future teachers.

"We've seen 3D maps in the past that were beautifully designed, but that were missing the function for people who are blind and visually impaired," says Anderson.

Graduate assistant Abby Tongue got the ball rolling to turn Anderson's vision of a functional tactile map into a reality, researching the feasibility and enlisting the help of WMU's virtual development studio.

"We were just getting our studio off the ground and were looking for interesting projects that used 3D media," says Kevin Abbott, interactive media specialist in the Office of Information Technology. "This project ended up being a great fit, so we took it on."

Sales student Leah Barton, a manager and technician in the virtual reality lab, worked with Tongue on designs for models of the College of Health and Human Services building and a detailed map of the structure's fourth floor, where the Department of Blindness and Low Vision Studies is located.

"Through trial and error, we decided just using the hallways would be the best approach for the smaller model, and we left the detail to the larger fourth-floor model," says Barton. "We didn't want the features to be too sharp or too jumbled, because you wouldn't be able to get a clear reading of anything."

After several attempts, the team crafted models sturdy enough to withstand heavy use and detailed enough to be functional.

"I've shown this to a lot of my friends who are blind. One of them said, 'I didn't realize the hallway was bent. I wondered why I kept drifting to the right and my cane kept hitting that side of the hallway!' Another friend didn't realize they'd been passing an elevator on their way to class every day," says Tongue, who is studying teaching students with vision impairments as well as orientation and mobility for children.

"We take information like that for granted, but for him it was empowering because now he can take that elevator if he wants."

PRACTICAL APPLICATION

Both 3D-printed models will be kept in the Department of Blindness and Low Vision Studies so that students can use them for reference. They'll also be utilized as teaching tools.

"We teach a class that all orientation and mobility specialists go through where they are under a blindfold two to three hours a day and have to learn indoor and outdoor skills," says Anderson. "For basic indoor travel, this will help them understand how the building is put together and how to plan a route from point 'A' to point 'B' and then effectively and efficiently get there."

Teachers, Anderson says, can also learn from these 3D models.

"We have to teach people who can't see the environment how to understand it,"

"I've shown this to a lot of my friends who are blind. One of them said, 'I didn't realize the hallway was bent. I wondered why I kept drifting to the right and my cane kept hitting that side of the hallway!' Another friend didn't realize they'd been passing an elevator on their way to class every day."

—Abby Tongue, a graduate student in the Department of Blindness and Low Vision Studies

Inside the College of Health and Human Services building, graduate student Abby Tongue holds a simple 3D model of the academic structure.

says Anderson. "We're looking at understanding the concept of four stories. If you can't see the building and recognize how large it is, if you can't conceive of the fact that a staircase on the first floor is in the same place as a staircase on the second floor, just one story above, that concept can be very difficult to learn."

Anderson and Tongue presented their research on 3D printing and concept development for students with vision impairments at the annual Michigan Association for Education and Rehabilitation of the Blind and Visually Impaired. The presentation gave teachers from across the state a chance to interact with the models and get an idea of how they could work.

A BROADER VISION

The successful development of these maps could lead to bigger things at WMU.

"We're looking at possibly doing a model of the entire campus so that our students in disability services could share it with anybody who's visually impaired on campus," Anderson says. "It could include the topography of campus and be used by people with mobility issues as well."

While it would be a large undertaking, Abbott says a map like that isn't out of the realm of possibility.

"A lot of data exists already that can be turned into 3D. There's almost certainly opportunity to take advantage of stuff that's already there and use it creatively," Abbott says. "That's part of what students who work with me learn. They determine what the goals are and how we use our tools to solve real-world problems.

Barton, who recently graduated, is drawing on this experience as she pursues job opportunities. Her ultimate goal is to start a career in 3D design.

"The companies that have shown

interest in me so far have really loved that I have a business background because I understand the process from both the creative and administration side," says Barton.

But there's more to this project than bolstering her resume.

"The biggest joy that I've gotten out of this project is knowing it will be helpful to other students. As a student myself, I know that going to college is already hard; I can't even wrap my head around trying to do it with blindness or low vision," Barton says. "So knowing that I contributed even a little bit to helping them navigate their experience in an easier and better way, that's all I want from it."

VIRTUAL IMPACT EXPANDING

The VR development studio was created after Abbott received a transformational grant from the University.

"There's a need on campus. We're seeing stuff that's coming out of the woodwork as more and more of these 3D-based digital tools are being used," says Abbott. "It's a great experience for the students working on these projects, because they get to tackle essentially real-world problems."

Abbott's team is collaborating with WMU's Bronson School of Nursing on a simulation for students as well as an application for the theatre department that allows students to interact with famous architecture. He's also been contacted about using 3D printing to make bones for anthropology students to study.

Abbott hopes to continue to build and develop the virtual reality programs on campus.

"It's taking off in so many industries. With professions evolving, there's a ton of need," he says. "If we can have the opportunity for students to not only graduate with expertise in their major but also have some idea to start thinking about VR development, it will be really beneficial both to them and their employers." ■

As Osman Karoma, left, listens, Abby Tongue, practices live audio description during a dress rehearsal at the Kalamazoo Civic Theatre.

Sound performance

Student enhances theater for enthusiasts

The work of WMU's world-renowned Department of Blindness and Low Vision Studies goes far beyond the classroom. Students like Abby Tongue are using their unique skills to help in the community as well.

Imagine going to a theater performance and not being able to see why people are laughing or gasping during the show. With Tongue's help, a new live audio description program at the Kalamazoo Civic Theatre is filling in those gaps in experience for people who are visually impaired.

"Sometimes you need to know that the villain is watching from above, because it changes the story, and you wouldn't know that without being able to see or having someone tell you," explains AnnMarie Miller, lighting and sound designer at the Civic.

PERSONAL EXPERIENCE

The theater started looking into audio description services at the suggestion of a patron.

"Sometimes you don't realize what people need until they say it," Miller says.

She researched the kind of equipment the theater would need to accommodate live audio descriptions and then reached out to WMU. When she connected with Tongue, the pieces fell into place.

"Abby loves theater. She took several friends to see a show at Western last year and was the only one in the group that didn't have vision challenges," Miller says. "She said that, throughout the show, the audience would clap and make noises and her friends would turn to her and ask what happened."

Tongue says audio description offers a solution that enhances the experience for patrons who are visually impaired and patrons who are sighted.

PREPARING FOR PERFORMANCES

Tongue asked a professor for tips on what to describe during a performance and also gained insight from her fiancé, fellow WMU student Osman Karoma, who is blind.

In December, she practiced her live audio description on the Civic's production of "Chitty Chitty Bang Bang."

"I think as sighted people, we don't get that feeling of confusion as often as someone who is blind, trying to put together the pieces of what's funny or what's going on," Tongue explains. "So, as an audio descriptionist, you want to relieve some of that (confusion) without stepping on the toes of the actors."

During the performance, Tongue delivered descriptions to patrons wearing special headsets.

"The people in the audience were really excited about it and said it helped them understand things better and gave them a fuller picture of what was going on."

The service was so successful that the Civic plans to provide live audio description during one performance of every show next season. ■

Premier papermaking

Facilities on the WMU Parkview Campus now house a one-of-a-kind in North America pilot-scale multi-ply paper manufacturing machine. The equipment, moved and donated from the National Institute of Standards and Technology, enables WMU to test and develop two-ply paper and paperboard used in a wider variety of products, says Lon Pschigoda, WMU Pilot Plants general manager.

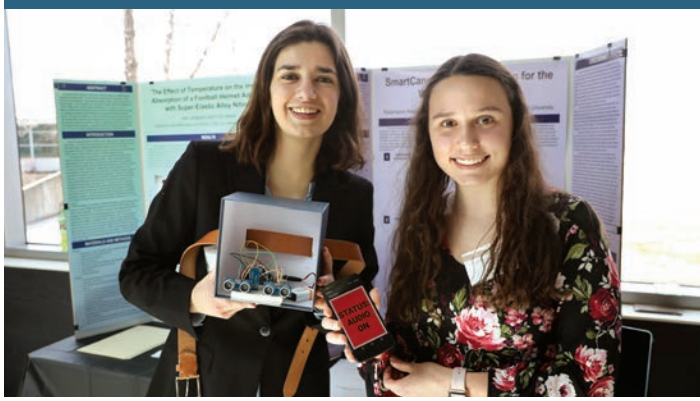
Servicing industry clients from around the world, the WMU operation provides an outlet for companies to test new paper types, fibers, chemistries and equipment on a smaller scale, without having to interrupt their own production lines.

The facilities are named in honor of alumnus Charles Klass, who worked for more than five decades in the pulp and paper industry.

Vested interest—

Nascent technology creates *new layer of safety beyond the white cane*

"**Creating** something that could potentially change somebody's life feels very fulfilling."
—Riley Zenas



High school students Anna Puca and Julia Strauss from the Kalamazoo Area Math and Science Center worked in collaboration with a group of WMU students.

An experience with a friend is fueling technological advancement in an engineering lab at WMU.

Dr. Pnina Ari-Gur, professor of mechanical and aerospace engineering, says a friend who is legally blind opened her eyes to some of the physical challenges people with visual impairments face every day. Ari-Gur thought there must be a way to use technology to improve upon what a cane can offer.

Engineering student Jacob Peterson, left, holds the vest he helped design under the guidance of Dr. Pnina Ari-Gur, right.

"A cane really only detects obstacles on the ground," says Ari-Gur. "But what if there is a low-hanging branch in front of them? There are many areas a cane does not cover."

The physical stress of constantly carrying and sweeping a cane can also take a toll on the person using it. In conversations with clinicians at the Battle Creek Veterans Affairs Medical Center, Ari-Gur learned that people with blindness and visual impairments sometimes develop carpal tunnel syndrome.

To make the experience easier, Ari-Gur came up with the concept for a smart white cane: wearable technology that removes the physical demand by detecting obstacles within a certain radius. It would come in the form of a light-weight vest.

She secured funding to start the project through WMU's Faculty Research and Creative Activities Award as well as a donation from Lawrence and Carrolyn Kopka, whose son, David, is one of Ari-Gur's former students.

Many drivers are familiar with the high-pitched beeps that sound if you're too close to another vehicle. Ari-Gur's virtual white cane works in a similar fashion but takes the concept a step further with audio messages.

Justin Rittenhouse, a mechanical engineering doctoral candidate, began developing the basic code to get the sensors in the vest to interact with a mobile application.

"I wanted to take on the project because I've never made a phone app and was curious how to do that," says Rittenhouse, who earned both his bachelor's and master's degrees in aerospace engineering at WMU. "Also, I enjoy helping people. In fact, almost all of the research I've done has been geared toward helping people in some way."

Two students from the Kalamazoo Area Math and Science Center—KAMSC—built on Rittenhouse's work, spending a semester writing code to upgrade the vest from two sensors to six and implementing verbal commands.

"Sensors are put inside so when it detects an object around you, it can tell you where it is and how far away it is in the app's audio board," says KAMSC collaborator Anna Puca, a junior at Loy Norrix High School in Kalamazoo.

Puca and Portage Central High School junior Julia Strauss worked in collaboration with a group of WMU students, under the guidance of Ari-Gur. Their work earned them the top prize at the Southwest Michigan Science and Engineering Fair and qualified them for participation in the Intel International Science and Engineering Fair—the world's largest international pre-college science competition—where they won the Joining Forces for the Community Award, presented by GoDaddy.

Riley Zenas and Jacob Peterson, both mechanical engineering majors, were part of a team of WMU students tasked with designing the vest and developing power sources for the technology.

"Creating something that could potentially change somebody's life feels very fulfilling," Zenas says. "Lowering the risk of carpal tunnel and just the physical stress of using a cane is something that is very important to the people who use it. That makes it very important to me that we do a good job in its construction

so that it may be used daily by those who need it."

The project focuses on harnessing the power from sustainable sources. Solar panels on the shoulders of the vest serve as the primary energy source. Getting those panels onto the vest required some research outside of Peterson's expertise.

"My fiancée taught me how to sew," says Peterson. "She's a dance instructor and often has to fix costumes for students."

Knowing that sunshine is sometimes hard to come by in Michigan, the students also worked on a secondary source of energy. They developed a shoe insert that can generate an electrical charge when a person walks. This piezoelectric material may be used to charge back-up batteries for the vest.

"Working on a project with real-world application is a great experience," Peterson says. "This helps with transitioning to designing products in our careers after college."

The project also offered the budding mechanical engineers a chance to diversify.

"It's very important for students today not to be locked into one discipline, but to have interdisciplinary skills. A mechanical engineering student should learn electrical engineering and programming, for instance," says Ari-Gur. "We try to get as much of a complete experience as possible."

SHAPING THE FUTURE

KAMSC works with several WMU faculty members to connect high school students to meaningful research projects, like programming the virtual white cane.

Strauss says her experience with this project made her aware of the technology available to students in WMU's College of Engineering and Applied Sciences.

"I want to continue doing research in college," says Strauss. "I think this has been a really good experience."

She and Puca also see the value in working on something that could make a difference in someone's life.

"I've seen people who have dealt with medical issues growing up and I've seen that technology can fix that," says Puca. "So knowing technology can help, I want to work on assisting people in need."

The project's success also validates the work they've been doing in the classroom.

"I truly believe that someday this wearable white cane will be able to help so many people all over the world," Strauss says. "I also liked seeing how coding—something I'm learning in school—can be utilized in the real world to make a difference in people's lives."

ADVANCEMENTS ON THE HORIZON

The smart white cane is still a work in progress. But Ari-Gur sees this basic model serving a need in such places as developing nations.

She also sees potential for the concept to be advanced for more high-tech markets.

"I'd like to eventually incorporate smart fabrics for the vest," says Ari-Gur. Smart textiles have digital components within the fabric. This would make the vest more lightweight and wearable but could also considerably raise the cost.

Ari-Gur is currently exploring other funding options to continue her research. ■

Student Taylor Arndt, who is visually impaired, tried on the vest as Ari-Gur explained to her how it would work.

HEY, SIRI —

WMU LEADS THE WAY IN STUDYING HUMAN-ROBOT COMMUNICATION

Siri maps out your spring break road trip. Alexa orders groceries and finds a bedtime story for your kids. Google Assistant turns off the lights you forgot to dim on the way out the door or raises the thermostat when the polar vortex sets in.

Living with robots is no longer science fiction. Scientists have begun studying how humans and machines interact, and WMU is a leading voice in the field.

Dr. Autumn Edwards, a professor of communication, is launching an international journal exploring this new frontier. She will serve as the inaugural editor-in-chief alongside associate editors, Dr. Chad Edwards of WMU's School of Communication and former WMU professor Patric Spence, who is currently working in the Nicholson School of Communication and Media at the University of Central Florida.

"What's so exciting about this journal is the cutting-edge topic matter," says Edwards. "There's no other one-stop destination for this kind of work."

Edwards says the idea for the *Human-Machine Communication Journal* came from talking to scholars in communication, media studies, human-robot interaction and psychology at various international conferences.

"There's been a lot of historic interest in how technology mediates what we do with each other," says Edwards. "Now, suddenly with things like voice assistants and the first social robots, people are actually turning to technology as an actual source and as a listener and talking to it, not through it."

The journal's editorial board is comprised of leading scholars from around the globe, representing every continent except Antarctica. They'll review submissions with an extremely critical eye for the most advanced research in the field.

"It's going to set the tone for what we know and how we study things in the future," says Edwards.

The first edition of the *Human-Machine Communication Journal* is expected to be published in September. Leopoldina Fortunati, a professor at the University of Udine, Italy, will curate the inaugural volume as the journal's first feature editor.

"She's a really prominent Italian feminist Marxist sociologist. So, she's thinking about the role of robots in society from a very philosophical level, and what it will mean for privileged groups and underprivileged groups and labor and reorganizing relations," says Edwards.

CUTTING-EDGE EDUCATION

When it comes to understanding the relationship between humans and robots, WMU is paving the way. The University's undergraduate human-machine communication course was the first of its kind in the country.

"I think in five to 10 years you'll see that class as a standard offering in communication programs all over the

country and the world, but here first," says Edwards.

WMU's Communication & Social Robotics Labs was also the first robotics lab in the nation to be housed in a communication department.

"The students that we've trained here in human-machine communication… they're all over the country in the best labs… because we're the only people training at that level for what they want to do," says Edwards. "We're known internationally at this point as a place that's on the forefront in HMC."

Edwards says the demand for professionals in the field is staggering.

"Last time I checked, there were tens of thousands of open jobs in technology user interaction with an average starting salary between $90,000 and $100,000. We really need people who can tell us about how people are going to interact with the web interface of our app. What are good design principles? If we use artificial intelligence assistants, what should they say?"

Matthew Craig got to know Edwards as an undergraduate student majoring in organizational communication. He says the research she and Dr. Chad Edwards were doing in the social robotics lab piqued his interest.

"My specific interests in this field are related to how we communicate emotion and relationships through human-machine communication," says Craig.

After graduating in 2017, Craig decided to pursue a master's degree in communication at WMU.

"The field of human-machine communication is growing rapidly, much like how we communicate through technology is rapidly changing," says Craig. "There are many applications for robots, ranging from retail to health care, but as this technology evolves, it's important we understand how humans interact with it."

Craig's work at WMU has been recognized internationally. During his studies he's examined interpersonal impressions of robots seeking rights and explored the moral and ethical concerns surrounding robot identity as well as assigning gender to machines.

"This program continues to give me hands-on experience with research," says Craig, who in his first year has already been published in the proceedings of an international conference as well as received department and Universitywide graduate research and creative scholar awards. "It's my experiences in this program that will set me apart from others in this field."

SOCIAL RESPONSIBILITY

Edwards says studying human-machine interaction is more important than ever as technology evolves. She says all communication entails some type of social influence, which can be threatening.

"Our position is that it's critical to not turn away from this but towards it, because if communication scholars aren't in the really early conversations, we don't have a say in the ethics, in using them for social good, and in the appropriate norms we want to reinforce," says Edwards. "Alexa and Siri both perform worse if you try to be polite. 'Thank you' and 'please' trip them up. So you're rewarded for being really curt and loud and forceful."

That could influence the conversations we have with other humans.

"If we're talking to machines all the time and not being polite, we may lose some of the niceties that we're expecting from each other." ■

Studying human-machine interaction is more important than ever as technology evolves.

Work by WMU may reduce US dependency on China for critical minerals

Stibnite is the predominant ore mineral of antimony. Antimony compounds help prevent skin burns, increase battery life, and refine glass used for cellphones. According to the U.S. Geological Survey, 83% of antimony consumed stateside is imported—mostly from China—leaving the U.S. susceptible to supply disruption.

"You don't know what you've got 'til it's gone," warns a 1969 folk song. But trade tensions with China have U.S. officials singing a slightly different tune: "You don't know what you've got 'til you look for it."

The escalating U.S.-China trade war has crystalized the need to assess America's critical mineral reserves, especially as the trade dispute has resulted in China increasing tariffs to 25% on rare earth mineral exports to the United States and threatening to stop these shipments altogether.

An executive order signed by President Donald Trump calls for a federal strategy to ensure a reliable and secure supply of critical minerals.

> The University has received a $35,000 grant from the U.S. Geological Survey to assess the Michigan's potential for supplying some of the 35 minerals the federal government considers vital to the nation's security and economic prosperity.

"These kinds of materials are so important to our technology and our everyday activities that we just can't afford not to have them. So, the president issued an executive order," says Dr. William B. Harrison III, emeritus researcher in geological and environmental sciences.

Now various government agencies are working together to develop plans and implement activities and objectives to begin the process of better understanding where the country's resources are, he says.

And WMU is at the leading edge of the hunt.

The University has received a $35,000 grant from the U.S. Geological Survey to assess the state of Michigan's potential for supplying some of the 35 minerals the federal government considers vital to the nation's security and economic prosperity.

Items on the list, which includes 15 rare earth minerals, are essential for producing everything from energy-efficient light bulbs, washing machines and smartphones to robots, electric cars and missile systems.

"We use tons of stuff in our daily lives, and it's all related to technology. But we don't really understand or appreciate where all the things come from that make up that technology," says Harrison, principal investigator for the grant.

"I guess we just assume that we have all these different mineral products that we need. And it turns out we don't. They're there, but because other countries have put more emphasis on them, they're developing their resources a little more efficiently than we are."

AMERICA'S DILEMMA

More than three decades ago, China embarked on a plan to capture the world market for rare earth minerals, in part by imposing few environmental or labor restrictions on mining companies and processors. It mines or processes about 95% of the global supply of rare earth minerals and has an estimated one-third of the world's rare earth reserves.

Meanwhile, the United States has only one rare earth minerals mine, the Mountain Pass Mine in California. Production there has stalled periodically because of closures due to contamination issues and more recently, bankruptcy. And despite reopening in 2018, the mine sends its output to China for final processing.

Harrison says the United States is rich in geological natural resources, including a lot of the rare earth minerals that have magnetic and optical properties so useful in making electronics more efficient. But it also imports these and other critical minerals.

These exotic-sounding materials, such as germanium, lanthanum and yttrium, actually aren't rare. They just occur in low concentrations and are mixed in with other minerals. That makes them difficult and environmentally challenging to extract. Even though many are used for green technologies, they take huge amounts of water to process and can leave behind tons of toxic waste.

NATIONAL FACT-FINDING

Along with the Michigan Geological Survey housed at WMU, some 40 state geological surveys received grants to assess the known and potential distribution and quality of critical mineral resources in their states.

At WMU, Harrison is leading a research team comprised of John A. Yellich, director of the Michigan Geological Survey; Dr. Peter J. Voice, research scientist and geologist; Dr. Joyashish Thakurta, economic geologist; Jennifer L. Trout, data manager; and several graduate and undergraduate students.

The team will spend the next year cataloging and preserving both unpublished and previously published critical minerals information by digging through materials at the Michigan Geological Repository for Research and Education— MGRRE—in WMU's Department of Geological and Environmental Sciences. Harrison founded MGRRE and serves as its director.

Both the repository and department are integral to the Michigan Geological Survey's work, and they have been since the state decided in 2011 to base the survey at WMU. Legislators approved the action primarily because of MGRRE, an archive of rock samples and oil, gas and water well records that constitute Michigan's most comprehensive collection of subsurface geological materials.

As part of the U.S. Geological Survey assessment grant, WMU will make its findings available to the public as well as private companies. As researchers and the Michigan Geological Survey continue to work on the assessment grant, Harrison says he's hopeful they will collect more information about the potential value of other mineral resources in the state.

"Whatever information is out there, it'll all be put into a big national database that anybody that's interested in exploring for these minerals can access. So, I think it's going to really stimulate private interest and private investment," he says.

"Companies would love to go out and do these kinds of projects, but they don't know what's there and they don't have the time or the resources to really go out and start looking in every state." ■

Engineering graduate student Tony Hanson, left, places a special retrofitted test helmet on a mannequin as SafeSense co-founder Dr. Binu Babi Narakathu holds the shock absorber and bonnet that will be placed inside the helmet shell.

Honored for innovation

Football helmet sensor-technology business is scoring goals

A company started by a professor and his students has earned wide recognition. SafeSense Technologies LLC was one of just 12 companies named a 2019 SmartZone Best Small Business Honoree at the annual Michigan Celebrates Small Business Awards in East Lansing.

"The award demonstrates that early stage emerging companies can succeed with the help of the Michigan Small Business Development Center tech team and the larger ecosystem as a whole," says Dr. Binu Baby Narakathu, a WMU alumnus and co-founder and president of SafeSense.

According to a letter from Gov. Gretchen Whitmer, SafeSense was selected by its local SmartZone for demonstrating "growth through technology commercialization and success with innovation."

Shock absorber padding with integrated sensors developed by SafeSense Technologies and WMU can detect and measure impacts when placed inside a football helmet.

The company is an outgrowth of the substantial research conducted at WMU that results in new findings, developments and discoveries that hold the power to benefit society. The transfer of these discoveries to the commercial sector is coordinated through the University's Technology and Innovation Advancement office.

"SafeSense demonstrates exactly what WMU is trying to do from a tech transfer standpoint," says Steve Tokarz, a mentor-in-residence at the University. He has been helping guide the company's success outside WMU through the office.

Now housed in the WMU Homer Stryker M.D. School of Medicine Innovation Center, the company launched in 2014 and was born in a WMU engineering lab years earlier. Narakathu was a doctoral student at the time.

He and three other students worked with faculty advisor and company co-founder Dr. Massood Atashbar, a professor of electrical and computer engineering, to develop technology that, when incorporated in a football helmet, could measure the location and intensity of blows to the head.

At a time when football concussions were beginning to make headlines, the concept quickly garnered interest.

"At this point, SafeSense has developed prototypes, performed field tests, formed a strategic partnership and is anticipating product launch," Narakathu says. "Growing the company to its current position and receiving the SmartZone award demonstrates industry acceptance—the first big step toward revenue."

The sensors have potential for more than just injury detection. They have the ability to enhance sports performance, as well.

"Recently a ruling came out to limit the number of hits high school football players can get at practice. But what type of hits are we limiting? What's the number of hits they see? And when they hit, are they doing it correctly?" asks Tokarz, who says coaches and trainers can use these sensors to detect dangerous habits in players and correct them. "If you're learning how to hit the correct way in practice, you're going to play better and safer during the real game."

SafeSense is on track to begin commercially marketing its sensor system for helmets in 2020. Tokarz says the company is looking at the possibility of expanding its sensor technology into other arenas and also is actively seeking collaborative opportunities. ■

Art and science project highlights importance of not blowing off STEAM

Student collaboration combines art and chemistry

Whether art imitates life or life imitates art is a question for philosophers to hash out. But that art imitates chemistry is no question in a unique collaboration at WMU.

The STEAM Collaboration project, funded in part by a grant from the Chemical Measurement and Instrumentation program of the National Science Foundation's Chemistry Division, brings together students from the Gwen Frostic School of Art, the School of Music and the Department of Chemistry. It challenges the groups to develop original works of art based on analysis by mass spectrometry.

"This is, as far as I know, the only event of its kind where students from visual art, music composition and chemistry collaborate so closely, in the sense that both the chemists and artists are involved throughout the entire process," says Dr. Andre Venter, an associate professor of chemistry who leads the project along with Patrick Wilson, an assistant professor of art, and Dr. Lisa Coons, an assistant professor of composition.

A decade since the Obama administration announced a program called Educate to Innovate—aimed at helping students excel in science, technology, engineering and mathematics—emphasis remains on STEM fields and STEM education. But many educators now also advocate for expanding the acronym to STEAM, emphasizing the importance of arts in preparing students for careers and helping spur discovery and innovation.

"STEM students are not well prepared for the creative needs that a future career in science requires," Venter says. "Too often our science students are trained to follow recipes, yet, to quote Albert Einstein, 'We cannot solve our problems with the same thinking we used when we created them.'"

THE PROJECT

The STEAM Collaboration allows students to conceptualize an experiment, interpret data into art and ultimately present that art in a community exhibition. For the most recent group of participants, the projects began in fall 2018 by choosing a local material to analyze. From river water to honey to coffee beans, students collected samples and then went to work in a chemistry lab.

"The students communicate with each other to bring the science to the artist and to bring the creative process to the science students. They earn a greater appreciation of each discipline," Venter explains.

"I had never been in a lab like that. It was interesting," says Evgeniya Kozhevnikova, a jazz composition master's student and Fulbright Scholar from Russia. "Chemistry was always something I didn't understand quite well."

The students use desorption electrospray ionization mass spectrometry, which essentially employs a tiny power-washing device to spray molecules off of materials and determine their molecular masses. The teams of students analyze the data to determine the molecules in the sample. Then, they create pieces inspired by those numbers.

Jared Tubbs, a music composition master's student from Tuscaloosa, Alabama, worked in a group that analyzed raw honey.

"I was trying to interpret the data and find ways to make it sound interesting," Tubbs says. "I ended up plugging it into a program where it generated sound waves off of different data points, which generated a certain frequency. After combining them, it created this buzzing noise."

Garrett Auzins, the visual artist Tubbs collaborated with, also used the concept of a beehive to create a sculpture out of cardboard, chicken wire, beeswax and other natural materials. He called it a metaphor for the production of honey. Tubbs placed transducers on the sculpture itself, generating the vibrations to create his music composition.

The opportunity to explore new technology and incorporate math and science into music is a welcome challenge for Tubbs.

"I've used Morse code in my pieces; now I've used spectrograph data and all sorts of things. I'm actually working on a piece right now where the performer has a gyroscope on their hand that interprets data and sends it to different effects," he says.

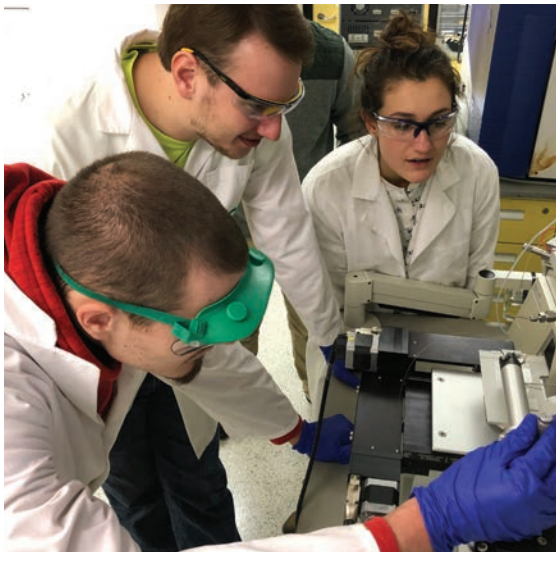
THE OUTCOMES

At the end of the project, students present their work to the community during Art Hop, Kalamazoo's monthly celebration of arts featuring exhibits and events. Venter says it gives students an opportunity to creatively and effectively communicate scientific knowledge, which he calls a necessary and important tool for success in science and other fields.

"Very few opportunities exist for students to communicate with and interact with the broader community—surprisingly even for artists, but especially for the chemists," Venter says. "They help address science literacy and stimulate interest in actual and timely issues within the Kalamazoo community." ■

"I hope that students will exit the project with a new appreciation for the value of art and science, respectively."

—Dr. Andre Venter, an associate professor of chemistry who leads the project



"We all collaborated and bounced ideas off each other. I would have never walked into the music department at all if I never worked with them."

—Andrew Simpkins, a chemistry student

Broncos' big ideas

WMU only Michigan university among finalists in NSF Idea Machine competition

The next big ideas to shape the future of science, technology, engineering and math research in the United States could be hatched at WMU.

Three submissions from WMU faculty and administrators were selected by the National Science Foundation as contenders for the grand prize in the NSF 2026 Idea Machine competition. The entries were among 33 selected from a pool of more than 800 entries from across the country. WMU is the only Michigan institution included in the field of finalists and the only single university in the nation with three finalists.

The WMU video finalists:

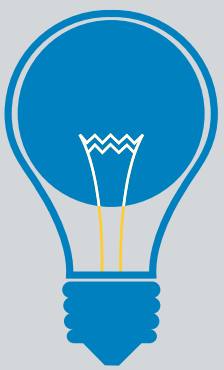
- **The STEM Teaching and Learning Incubator—**Dr. Todd Ellis, assistant professor of geography and science education, focuses on empowering K-12 educators to develop new approaches to teaching and learning STEM disciplines by providing a regional hub for instructors that offers support for design, implementation, evaluation and dissemination of their ideas.
- **Reversibility: Future of Life on Earth—**Dr. Bilinda Straight, professor of anthropology and of gender and women's studies, asks how the reversibility, irreversibility and tipping points of different types of systems are determined and how this could potentially impact the future of life on earth. Addressing this question requires novel ways to examine interconnections between systems that may include human experience and motivation.
- **#WhyNotMe: STEM Diversity Drivers—** Dr. Terri Goss Kinzy, vice president for research and professor of biological sciences, and Dr. Lori Wingate, director of research at the Evaluation Center, discuss novel ways to identify experiences that increase the success of underrepresented professionals in STEM fields.

Each of these projects was submitted as video pitches to the NSF. View them online at wmich.edu/research/bronco-big-idea-winners-2019.

Winners of the competition will ultimately be presented at nsf.gov/ideamachine.

CAMPUS CONTEST

WMU also mounted a big idea competition. Winners were selected by a committee of junior faculty and graduate students, who are the future of STEM. The winners were Ellis, who earned a $6,000 research award; and two undergraduate students, Patrick Leny and Marsad Zoardar, who each earned a $1,000 scholarship and an additional $5,000 award to conduct research. ■



Awarded for excellence

Geography program earns national accolade

The American Association of Geographers has given its 2019 Award for Program Excellence to the University's Department of Geography.

WMU earned the award for its Master of Science in geography. The honor was formally presented at an awards luncheon this spring during AAG's annual meeting in Washington, D.C.

Established in 2016, the Award for Program Excellence recognizes geography departments and programs within blended departments that have significantly enhanced the prominence and reputation of geography as a discipline as well as have demonstrated the characteristics of a strong and engaged academic unit.

"This award is a recognition and affirmation by our peers of the high standards we have set for geography master's programs across the nation," says Dr. Benjamin Ofori-Amoah, chair of WMU's geography department.

"The award will help us to recruit additional students and motivate us to continue to be the best geography master's program in the nation."

In this year's award cycle, 10 geography departments were nominated by AAG's nine regional divisions. Five were selected as finalists, and WMU's department earned the award.

WHY WMU WAS SELECTED

In its citation honoring WMU as this year's winner of the Award for Program Excellence, AAG praised the Department of Geography for the impact its broad range of activities have on educating future geographers and promoting the discipline to the wider world.

The organization specifically cited the department's robust research profile, continued broadening of the curriculum, and systematic outreach to K-12 schools and area community colleges.

In addition, AAG said it was impressed by the strong financial support the geography department gives its graduate students. This support, which ensures that WMU's students are well-prepared for the future, includes ample opportunities to conduct field research, teach, participate in professional gatherings and network.

"Not only are these graduate students well-resourced, they become successful," AAG wrote in the citation honoring WMU. "The University's graduate students move on to Ph.D. programs, successfully pursue internships, or move into careers with employers in the public sector, such as the United Nations' refugee agency and various state and federal agencies, and the private sector in companies such as AccuWeather and U.S. Cellular."

WHY STUDENTS CHOOSE WMU

Greg Carlton, an alumnus from Granger, Indiana, who graduated June 29 with a master's degree in geography, says he wanted to study at the University because of the geography department's excellent reputation and flexible programs.

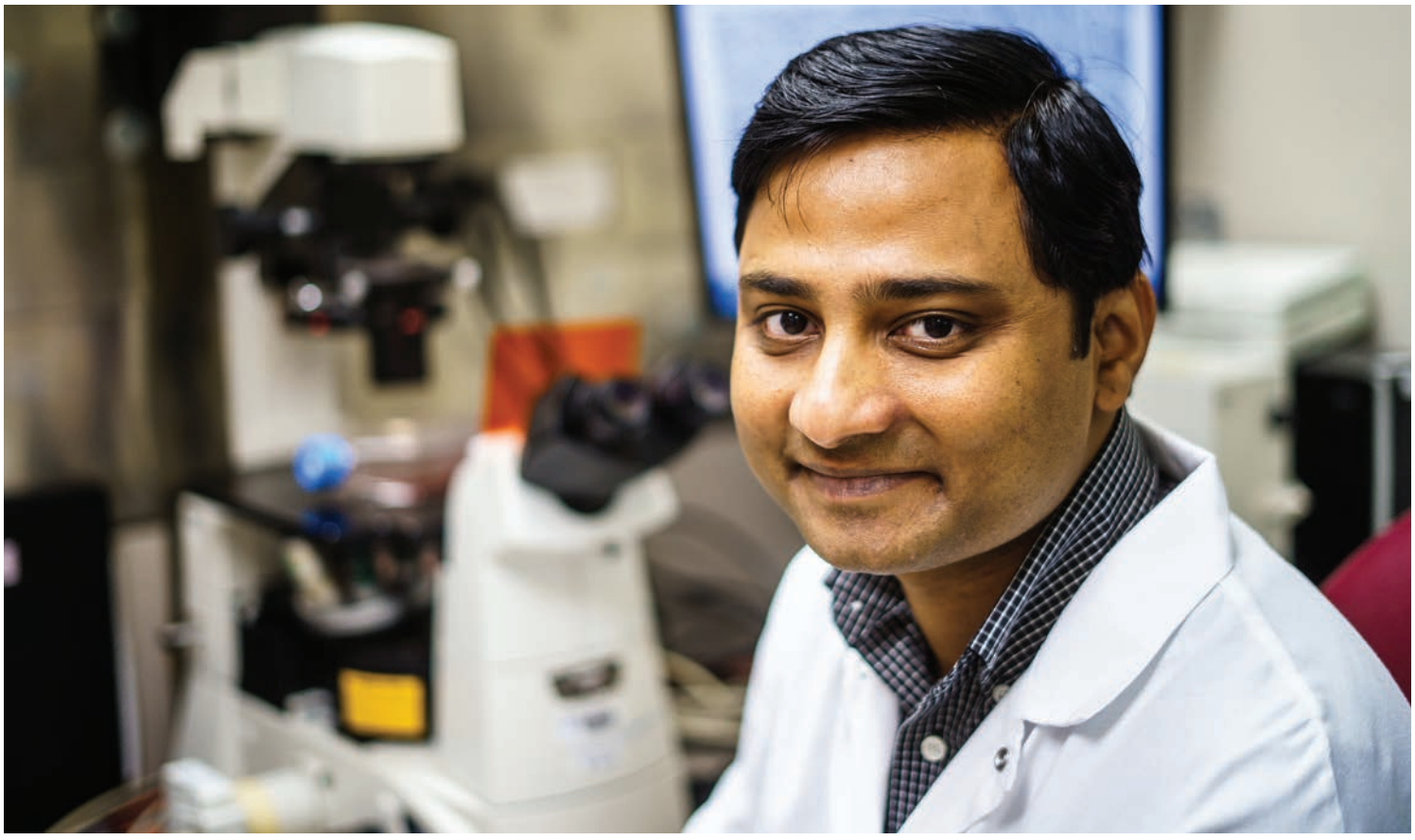
The community and regional planning concentration graduate says WMU's Department of Geography is well regarded in the Midwest and he had heard good things about it while an undergraduate student at Ball State University. Plus, Carlton adds, he was looking for programs that would allow him to combine his background in geography with his interests in regional planning.

"Most planning programs are housed in architecture and engineering departments. What attracted me to WMU's program is the fact that it's part of a geography department," he says. "More and more, planners need geospatial skills to thrive in their professions, and the WMU master's program allowed me to advance my knowledge in this area while I also learned the fundamentals of planning."

Another key feature of the program is what Carlton terms "a plethora" of opportunities for personal and professional development that sets it apart from other master's level programs.

"Just in my short two years in this program, I presented at two conferences, took part in an internship, worked as a teaching assistant and took part in two planning presentations with local officials and community members," he says. "These experiences, which were offered to me through the department, helped me grow academically and professionally."

Now, thanks to his work at WMU, Carlton says he has been accepted into a doctoral program at the University of North Carolina at Greensboro this coming fall. ■



Dr. Yogesh Suryawanshi's research at WMU helped set him up for career success. "It gave me the platform to actually catapult myself to places like Mayo," he says.

Mayo Clinic biologist is at the cutting edge of cancer research

Not all heroes wear capes, but they often wear lab coats.

Dr. Yogesh Suryawanshi could be on the path toward a cure for cancer. After receiving his doctorate in biological sciences from WMU in 2017, he secured a job in the department of molecular medicine at the Mayo Clinic in Rochester, Minnesota, developing viruses that can attack cancer cells.

"The core problem with cancer is why it starts: the immune system fails to detect and kill cells that become cancerous," says Suryawanshi. "You can genetically modify viruses to exploit the vulnerabilities in cancer cells to not only selectively kill them but also activate the anti-cancer immunity."

Suryawanshi grew up in Latur, India, and was working as a surgeon in Mumbai when he developed an interest in cancer research. He says he saw a lot of cancer patients in his surgeries and began thinking about the urgent need for alternatives to conventional treatment options.

"Chemotherapy and radiology are tricky, especially in kids and older patients, because of toxicity," says Suryawanshi. "I knew there was a need for more treatment options which can be equally good on their own or can be combined with conventional treatments to make them more effective."

Suryawanshi researched experts in the virology field as he started applying to universities to further his career. Dr. Karim Essani, an eminent virologist and professor of biological sciences at WMU, stood out.

"I found Dr. Essani's work impressive. At the time he was in the initial phase of tumor virology work and wanted to shift the focus to using viruses for cancer therapy, which aligned with my research interests."

His work at WMU helped set Suryawanshi up for success when it came time to apply for jobs.

"It gave me the platform to actually catapult myself to places like Mayo, which are really high-end places," Suryawanshi says.

"What I learned at WMU helped me stay up to date with cutting-edge cancer research and match with one of the top minds in the field."

Now, Suryawanshi spends his days in a lab doing work that could potentially save lives.

"Right now, our lab has several ongoing preclinical and clinical trials going on, and we do see some pretty encouraging results." ■

Two WMU leaders recognized as 'notable women in STEM'

Dr. Terri Goss Kinzy and Dr. Carla Koretsky, both scientists and administrators, have been recognized as 2019 Notable Women in STEM by *Crain's Detroit Business*. The publication cites their leadership in the workplace and community and lauds their accomplishments in research, teaching and administration.

Kinzy, WMU's vice president for research and a professor of biological sciences, is internationally known for her work in the areas of gene expression and protein synthesis. She says her love of science started early, and she's a strong advocate of increasing diversity in the field.

"I consider myself fortunate that my parents, while not scientists or even college graduates, encouraged my natural interest with science kits, microscopes and other opportunities to explore," says Kinzy, who came to WMU in early 2018 from Rutgers University, where she did extensive work in molecular biology and biochemistry as well as pediatrics. "I think kids from all backgrounds have a natural interest in science, we just need to encourage them to explore that."

A fellow of the American Association for the Advancement of Science, Kinzy also has served in multiple roles with the American Society for Biochemistry and Molecular Biology and serves on that organization's political affairs advisory committee. In addition, she is a member of the Council on Research Executive Committee for the Association for Public and Land-grant Universities. She's also secured more than $9 million in funding on various projects from the National Institutes of Health, National Science Foundation and other agencies.

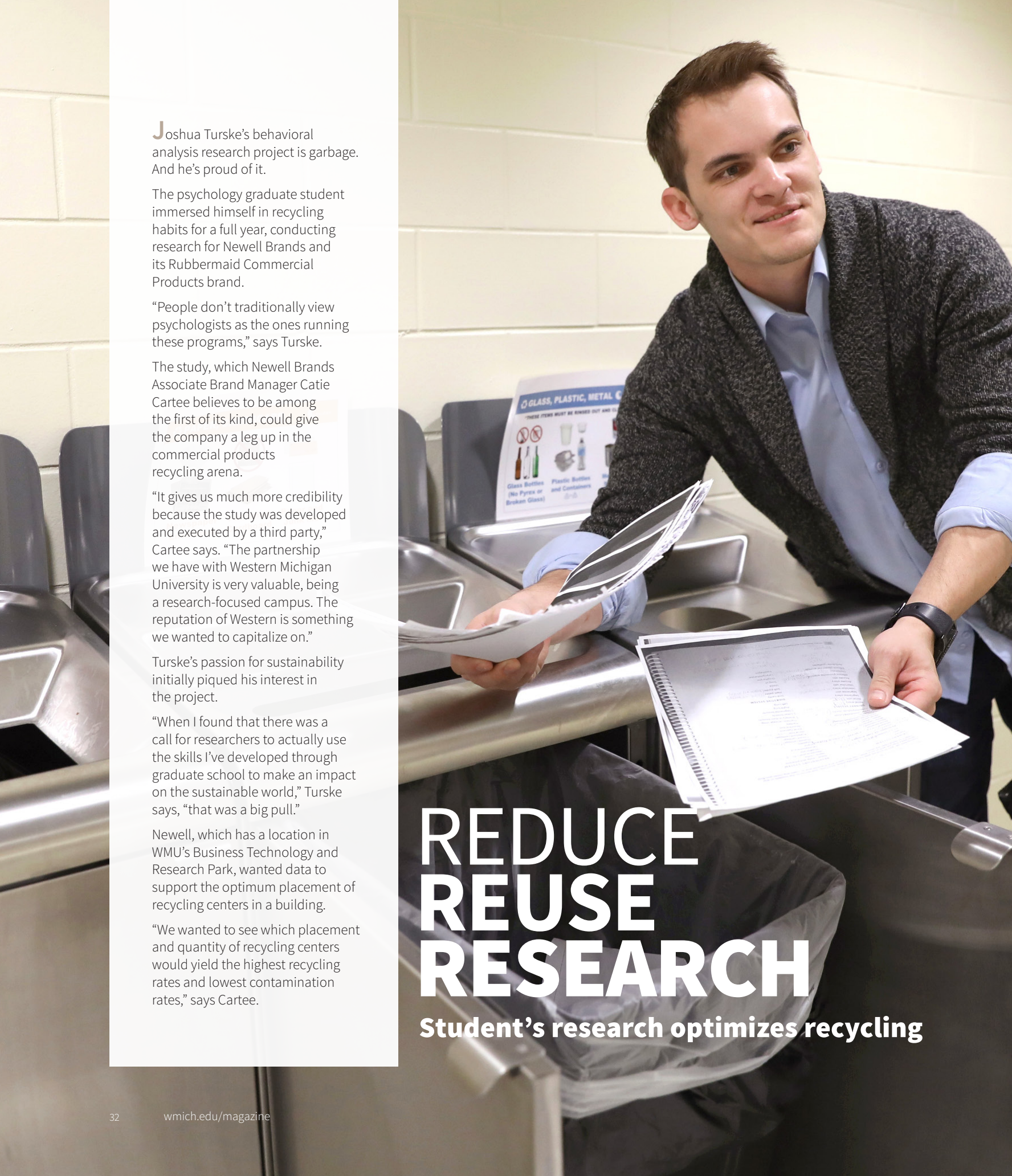
Dr. Carla Koretsky, dean of the College of Arts and Sciences, left, and Dr. Terri Goss Kinzy, vice president for research, perform at the top of their professions.

Koretsky is the dean of the College of Arts and Sciences, WMU's largest and most diverse college. She has served as a faculty member in the Department of Geological and Environmental Sciences and the Institute of the Environment and Sustainability since arriving at WMU in 2000.

An active researcher, Koretsky focuses on aqueous geochemistry and biogeochemistry, seeking to integrate field, laboratory and modeling studies of mineral-water-biological interactions near the Earth's surface.

"I decided to pursue science because of my desire to help solve global environmental problems, especially those related to issues like clean water and air," Koretsky says.

She has been awarded more than $1.1 million in external grants from such agencies as the National Science Foundation, U.S. Department of Energy and the American Chemical Society. Those grants included a prestigious NSF CAREER Award. And in 2014, she was selected as the winner of an international award for distinguished service to her profession by the Geochemical Society. ■



REDUCE REUSE RESEARCH

Student's research optimizes recycling

Joshua Turske's behavioral analysis research project is garbage. And he's proud of it.

The psychology graduate student immersed himself in recycling habits for a full year, conducting research for Newell Brands and its Rubbermaid Commercial Products brand.

"People don't traditionally view psychologists as the ones running these programs," says Turske.

The study, which Newell Brands Associate Brand Manager Catie Cartee believes to be among the first of its kind, could give the company a leg up in the commercial products recycling arena.

"It gives us much more credibility because the study was developed and executed by a third party," Cartee says. "The partnership we have with Western Michigan University is very valuable, being a research-focused campus. The reputation of Western is something we wanted to capitalize on."

Turske's passion for sustainability initially piqued his interest in the project.

"When I found that there was a call for researchers to actually use the skills I've developed through graduate school to make an impact on the sustainable world," Turske says, "that was a big pull."

Newell, which has a location in WMU's Business Technology and Research Park, wanted data to support the optimum placement of recycling centers in a building.

"We wanted to see which placement and quantity of recycling centers would yield the highest recycling rates and lowest contamination rates," says Cartee.

The research also had a practical application on campus. Lu DeBoef, working in WMU's Office for Sustainability at the time, wanted to identify ways to limit contamination.

"If the recycling is contaminated, you have to throw it out," says DeBoef, who now works in WMU Facilities Management as recycling and sustainability program manager. "I needed to know what was being correctly recycled, what was incorrectly recycled, and what was being thrown away."

THE RESEARCH

Turske developed four research questions to explore during the study:

- What type of recycling label is better: text- or image-based?
- What number of pods lead to optimum recycling?
- What is the optimum placement of pods?
- Which type of container material produces the best results?

He and his team of more than a dozen student researchers began their work in the summer of 2017, examining recycling bins inside Wood Hall.

"Wood Hall is unique. We looked at the first and second floors and they're almost identical. So, it made for a good research control," says Turske. "If the layout was different, it would be a confounder in the data, which would mean we couldn't make as strong of statements."

Strong research, it turns out, also produces strong odors. In order to find out what people were tossing into bins, Turske and his team had to sift through trash, piece by piece, and document it. The team worked closely with custodians, who essentially became researchers themselves. They would gather the waste from pods throughout the building and dump it onto the loading dock in clusters.

"Every day we would sort through everything to rate it for accuracy. You lost your sense of smell, which was good," Turske laughs. "It made it easier to sort."

Sometimes the trash told a story.

"You could tell when someone had a really bad test because all of their notes would be in the paper bins."

In addition to documenting the contents of bins, Turske and his team shifted the placement of recycling pods throughout the building every couple of weeks.

"At 11 p.m., we would physically move the bins ourselves on chairs," recalls Turske. "We were only questioned by the cops once, who were really confused about what we were doing."

The research team documented the number of pods per floor during each phase, as well as their location in respect to entries and exits and the type of recycling prompt used (text or images).

The yearlong project turned into a much larger undertaking than Turske expected. A small price to pay for solid research.

"It's not always clean, but it's fulfilling," Turske says. "Because being able to see every phase of this project…you could see the science unfold in front of you, which was very validating."

THE FINDINGS

One of the main findings of Turske's study involved signage placed near recycling centers. Data showed people were more likely to recycle—and do so correctly—when a sign above the bins featured pictures of what could be disposed of instead of just text.

"If you're in a hurry and don't have time to read the text, you'll just throw something away," says Turske. "The pictures are a little larger. You can see them from afar and kind of preemptively know what's supposed to go where and recycle more efficiently."

"We found making recycling easier makes people want to do the behavior more, which is great."

Another aspect of the study analyzed the number of bins needed to maximize recycling efforts and efficiency, something important to both Rubbermaid Commercial Products and WMU.

"We found that when we had six bins (per floor), trash started to accumulate in the bathrooms and classrooms, which is not good for custodians because it takes time out of their day to clean," says Turske. "It also makes Western look bad if trash is everywhere."

The team found no difference between the amount of waste captured by nine or 12 bins, determining the smaller number to be the "sweet spot" for recycling.

They also learned bins placed near entrances and exits were most effective, and that the material Rubbermaid Commercial Products uses for its bins also decreased recycling contamination.

"People wanted to interact with the RCP bins more due to the fact that they looked nicer, they seemed sleeker and were more uniform," says Turske. "They said they would actually feel bad if they didn't recycle properly."

THE TAKEAWAYS

Turske presented his findings at Newell Brands, Commercial and Consumer Solutions divisional headquarters in North Carolina.

Newell plans to use Turske's project to train its field team.

"Oftentimes, distributor partners come to us and ask us, 'My customer wants to implement a (recycling) program. What do they need?'" says Cartee. "This helps us give a more educated, data-based answer."

"It was truly a win-win all the way around," says Bob Miller, former associate vice president for community outreach at WMU. "The company got some valuable data that they can use in product development and also in marketing. The University got an opportunity to save some money, but also got a product that is working, and it's adding to our sustainability." ■

WESTERN MICHIGAN UNIVERSITY
1903 W Michigan Ave
Kalamazoo MI 49008-5433

NON-PROFIT
U.S. POSTAGE
PAID
WESTERN MICHIGAN
UNIVERSITY

This large-scale pollinator house serves as an informal living-learning laboratory for anyone who wants to create habitat to attract more native bees and other dwindling creatures that pollinate. Built and installed by landscape services personnel on the Parkview Campus, it's located off of Campus Drive southwest of the soccer complex near one of the campus' ponds.